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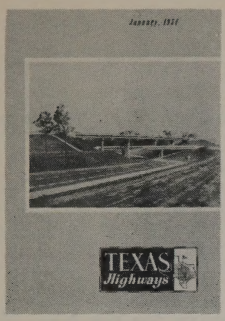
January, 1954

TEXAS Highways

About the Cover . . .



The cover picture shows the three-level grade separation connecting to the west end of the Baytown tunnel. The structure is described on page 17 of this issue, and is the first such structure on the Texas Highway System, and one of the few in the world. Experts who have seen this three-level grade separation are in complete agreement that it is not only pleasing to the eye, but is capable of safely and conveniently handling large volumes of traffic.

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TEXAS Highways

The purpose of this publication, "Texas Highways," is to furnish a medium for presenting practical ideas and information. Employees are invited and urged to submit suggestions and relate experiences which would benefit or be of interest to Highway employees. These conclusions and data are not necessarily endorsed by the Highway Department nor are they to be construed as instructions.

Photographic services are available and other assistance may be obtained, if desired, in preparing material for submission. All material and comments should be directed to the Information and Statistics Division, Austin 14, Texas.

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COMPILED AND EDITED
Information and Statistics Division

NOTES . . . from the State Highway Engineer

D. C. GREER
State Highway Engineer

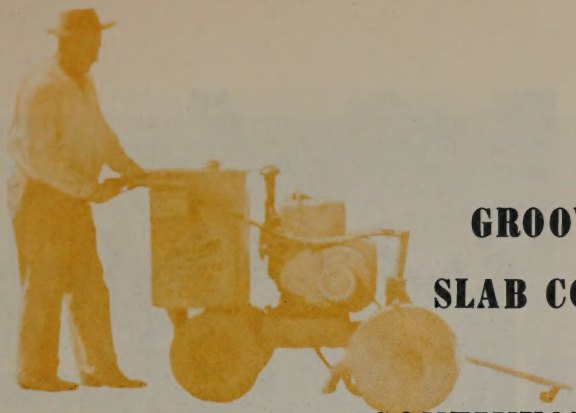
IN THIS, the first issue of TEXAS HIGHWAYS for the New Year 1954, I would like the privilege of extending to each and every one of our 10,200 Highway Department employees my personal thanks and commendation for a job well done in the year 1953 and my best wishes for an even better job during this year of 1954.

We had the largest year in our history in 1953, expending with courtesy, efficiency, and economy approximately $160,000,000 of public funds derived from the taxpayers of Texas. We spent approximately $111,000,000 in the construction of our city streets, farm-to-market roads, and primary or state highways. This covered not only construction but reconstruction and heavy betterment work. Forty-nine million dollars of the 1953 expenditure was spent for maintenance operations, overhead, highway patrol, and other fixed charges in our operations budget.

The total system of roads now operated by the Highway Department has reached 50,581 miles, of which amount 24,295 miles are state operated farm-to-market roads. Every road in the state road system is either paved or financed for paving.

The Federal-Aid Primary highway system in the rural areas of the state carries 58 per cent of our total traffic. We expend 34 per cent of our revenues on this system of roads for construction and betterment. The urban portion of our Federal-Aid Primary system carries 13 per cent of our total traffic, and we expend 18 per cent of our income on this section of the system. Our state highways carry 17 per cent of the total traffic, and we expend 16 per cent of our funds on these roads. The state farm-to-market roads carry 12 per cent of the total traffic of the state, and we expend 32 per cent of our revenues on this particular system. These figures do not, of course, present the complete road picture of our state, but are passed on to you with the thought that they might be of interest in showing just how we are operating the Texas road system with the funds made available to us by state and federal laws and the requirements of such laws.

It is my firm belief that the majority of the people of the State of Texas now operating the three and one-half million motor vehicles in our state are appreciative of the work done by the employees of the Texas Highway Department in the operation of our vast system of roads. *As long as we continue our courteous and efficient operation of Texas highways we will continue to merit this confidence from our people.*



GROOVING AND SEALING SLAB CONSTRUCTION JOINTS ON CONTINUOUS I-BEAM STRUCTURES

Frank W. Cawthon, District Engineer
District 18

This district has recently completed the grooving and sealing of 4,922 linear feet of construction joint on various continuous unit I-beam structures on Central Expressway, S.H. 356, and Loop 12, Dallas County.

The plans from which these bridges were constructed did not provide for sealing the joints on construction and in most instances the joints had opened, allowing water to get through and stain the I-beam steel. The grooving and sealing of the joints was performed to block off the entry of water which we felt would eventually damage the I-beams by rust.

All of the groove cutting was done with the Tri-Line Concrete Cutter, Equipment Number 10882B, recently purchased by D-3 for use by all districts for this or allied type work. All of the joint sealing was done with cold applied Enamelite mastic type joint filler compound with equipment furnished by the Lofland Company of Dallas. Two different grades of the Enamelite compound were used, Enamelite Number 88 and Enamelite Number 77. The Number 88 material is the heavier or thicker of the two and, in our opinion, is the most satisfactory for the particular operation we were engaged in. The Number 88 material comes in 90-pound units composed of a 51-pound sack of Enamelite Dry Asphalt and a 5-gallon can of Presstite Number 88 Enamelite Sealing Compound. These ingredients are mixed together in a small pugmill mixer shown in the pictures. The mixer has a worm gear in the bottom which forces the mixed sealing compound through a discharge hose and a nozzle into the groove sawed in the bridge slab. The Number 77 compound is a ready-mixed material and is applied from the drum to the groove in the bridge slab by means of a pump working off a compressor, as indicated in the accompanying pictures.

We tried the following methods of sawing and sealing these bridge joints:

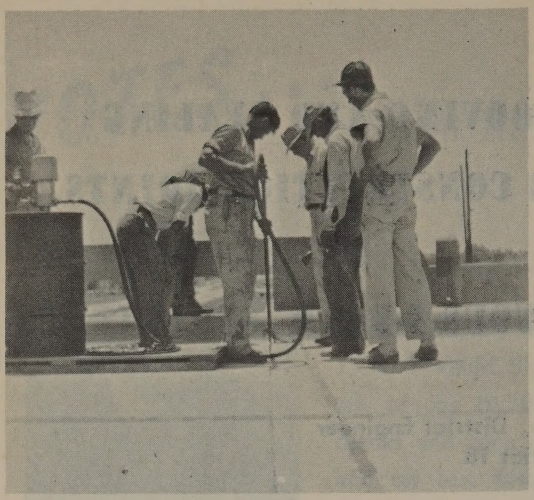
Method 1 - One-fourth-inch-width sawed joint sealed with Enamelite Number 88 mastic type joint filler compound.

Method 2 - One-fourth-inch-width sawed joint sealed with Enamelite Number 77 mastic type joint filler compound.

Method 3 - Three-eighths-inch-width sawed joint sealed with Enamelite Number 88 mastic type joint filler compound.

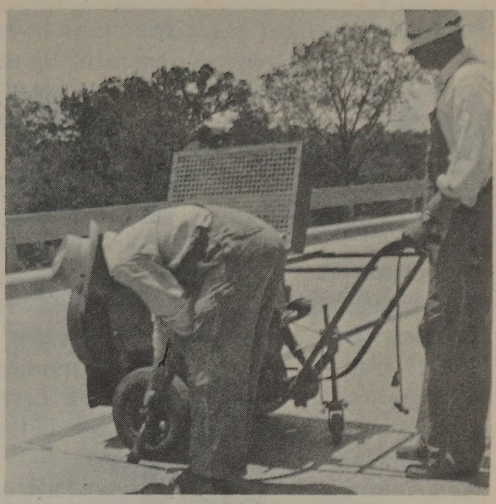
It is our belief that our best results were obtained with Method 3, since the slightly wider sawed groove made application of the compound easier and better because the nozzle of the sealing compound machine fitted into the groove better.

All of the grooves were cut three-

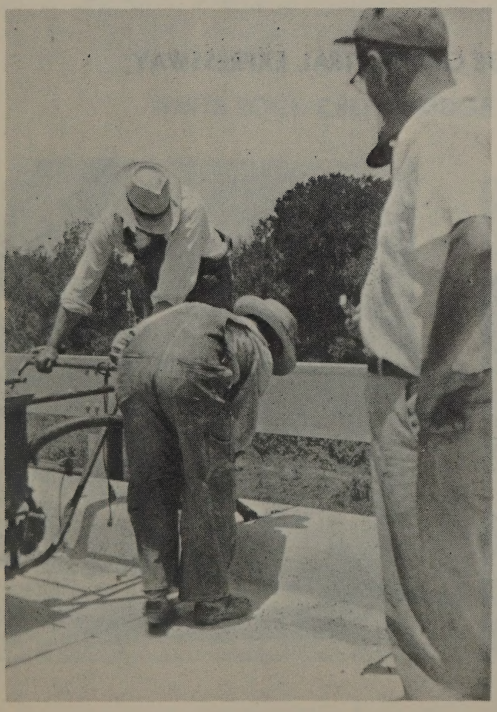


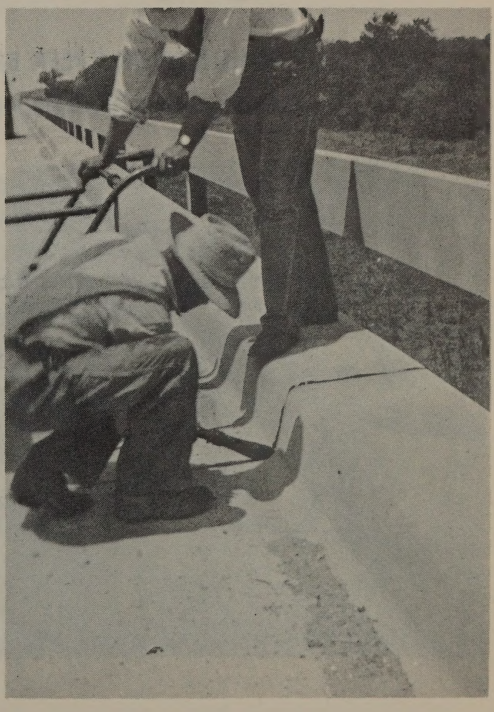
LOOP 12 OVERPASS OF U.S. 75

Sealing one-fourth inch by three-fourths inch sawed joints with Enamelite Number 77.



TRINITY RIVER RELIEF BRIDGE, LOOP 12





Sealing three-eighths inch width, three-fourths inch depth sawed joints with Enamelite Number 88.

WHITE ROCK CREEK BRIDGE ON CENTRAL EXPRESSWAY

Operations involved in cutting a groove one-fourth inch wide and three-fourths inch deep are shown here.

fourths inch deep on the roadway to the structures but in order to make the eighteen-inch diameter saw blades clear the steel bridge rail we had to cut approximately five inches deep on the bridge curbs. The saw blades are one-eighth inch in thickness, so two blades were used on the machine to cut the one-fourth-inch-width grooves. In sawing the three-eighths-inch-width grooves, we used a worn out saw blade as a spacer between two good blades. We were able to saw approximately 3,000 linear feet of bridge joint with a pair of blades and our cost of sawing amounted to $0.149 per linear foot exclusive of saw blades. The original blades purchased with the saw cost $233.75 each, which indicates that we used $0.156 per linear foot for saw blades, making a total cost of the grooving $0.305 per linear foot of bridge joint. The concrete saw worked perfectly and no time was lost during the sawing operations. We were able to saw approximately 100 linear feet of bridge joint per hour.

The total cost of sealing the 4,922 linear feet of joint reflects a unit cost of $0.145 per linear foot. Difficulties were encountered during the first few days of sealing in getting the machine for applying the joint filler material to work properly, but after installing a larger discharge hose on the machine it worked satisfactorily and the cost dropped materially. The last 3,000 linear feet of joint were sealed at a cost of $0.084 per linear foot.

The joint sawing and sealing operations were performed under the supervision of R. L. Lawrence, Senior Maintenance Foreman of Dallas North Side Section and A. E. Rainwater, Senior Maintenance Foreman of Dallas South Side Section. This project was under the general supervision of District 18 Maintenance Engineer G. G. Green, in cooperation with A. J. Sherrod, Bridge Engineer of D-3.

WHITE ROCK CREEK BRIDGE ON CENTRAL EXPRESSWAY

Cutting one-fourth inch width, five inch depth groove in curb.

Sealing one-fourth inch width, three-fourths inch sawed joints.

DRILLED SHAFT FOUNDATIONS FOR FM BRIDGES

W.L. Patrick, Senior Resident Engineer
and George F. Gold, Associate Resident Engineer
District 13

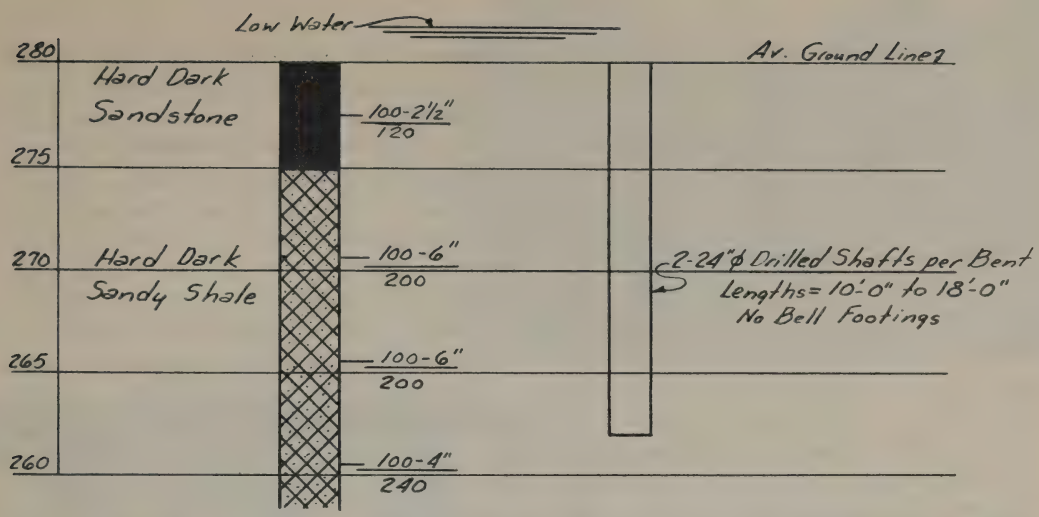
Recently the third farm to market road bridge using the relatively new drilled shaft and underreamed foundation-type substructure was completed in Fayette County. This is a 360-foot structure on FM 609 across Buckners Creek, and is made up of eight 25-foot slab spans (FS-8-24-25) with two 24-inch diameter drilled shafts and four-foot, six-inch diameter bell footings for each bent, and one 160-foot continuous I beam unit (FCI-9-24-160) with two 36-inch diameter drilled shafts and six-foot diameter bell footings per bent.

Previously completed were two structures on FM 154. One is composed of seven 25-foot slab spans (FS-8-20-25) with two 24-inch diameter drilled shafts, without bells, per bent. The second is a three span FS-8-20-25 with two 24-inch diameter drilled shafts and five-foot diameter bells under each cap.

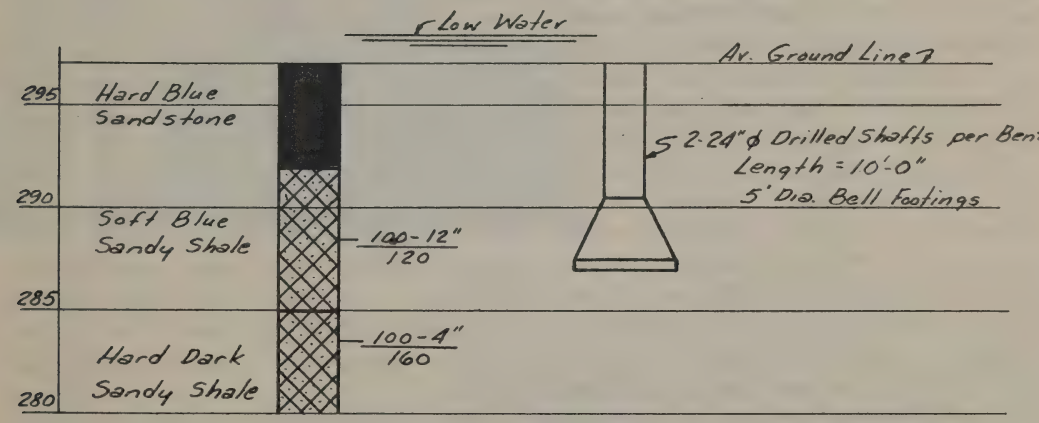
At all locations it would have been possible to use what might be considered an older, more conventional type substructure. On the sketches showing the average boring log it can be seen that on FM 154 a spread footing type foundation could have been specified although excavation quantities would have been much greater, and it would have been necessary to add the bid items for, "Special Structural Excavation" and/or, "Rock Structural Excavation" to the contract. On FM 609 a piling type foundation could have been specified, but it is in the replacing of piling that the drilled shafts has one of its greatest merits.

It is true that there are many instances and locations where subsurface conditions will not warrant the use of drilled shafts instead of piling, but when possible to select between the two, the use of the shaft will save time and expense involved in constructing pile beds, curing piles, driving test piles, making cutoffs and build-ups, and as might have been the case on FM 609, digging deep pilot holes in order to obtain sufficient penetration. The use of the drilled shafts at these locations not only proved that such a foundation was feasible, but also effected a realization of some economy. As contractors gain more experience in drilled shaft construction it is believed that this type of design will show a greater economic advantage over piling and spread footings as a result of lower bid prices.

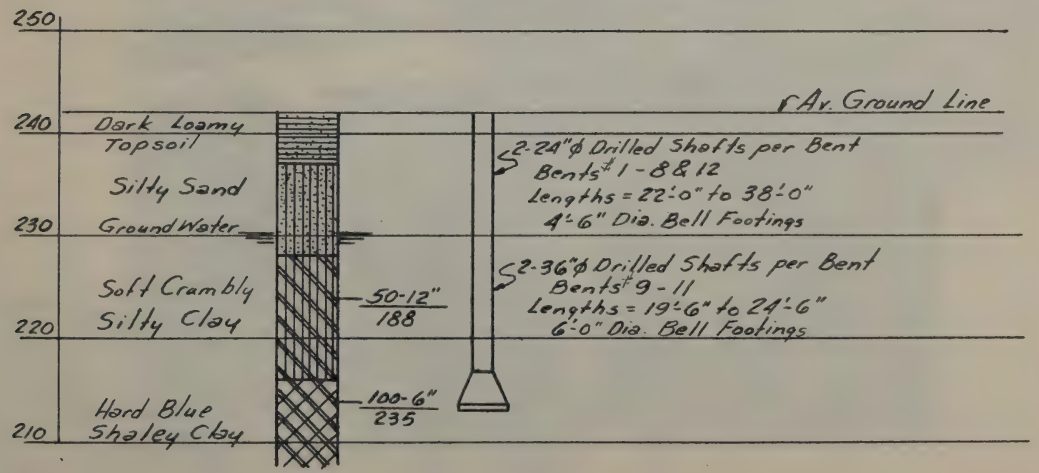
In constructing the shafts for the bridges on FM 154 the contractor elected to drill only through the softer material near the ground surface and then use hand labor to excavate through the harder strata below. His reason for this method of construction was that it would be too expensive to rent a machine capable of drilling to the full depth of each shaft. This proved to be false economy and resulted in slow progress, high labor costs, consid-



Average Log Buckners Creek, FM 154 (Intermediate Bents)



Average Log Jack John Creek, FM 154 (Intermediate Bents)



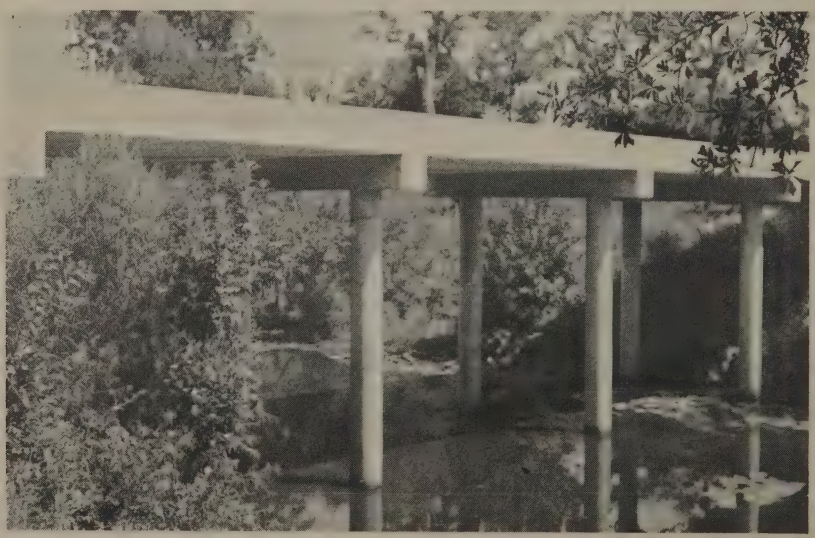
Average Log Buckners Creek, FM 609 (All Bents)

erable seepage water trouble, the necessity of casing twelve of the twenty-four shafts, and the loss of three casings due to the lack of equipment with sufficient pulling power.

On FM 609 the contractor (incidentally the same contractor who had constructed the bridges on FM 154; Norman L. Larson, Austin,) sublet the construction of the shafts and bells to a firm that specialized in such work, and the results were much more favorable. A machine was used that was not only capable of drilling to the full depth of each shaft, but could also excavate the bell by the addition of a special attachment. Although the subcontractor elected to case all the shafts, he lost no casings. This was due both to the presence of machinery with sufficient pulling power to handle the embedded casings, and special attention given to the placement of this machinery before concrete was poured.

The only difficulty encountered on this structure was caused by the presence of seams of flowing water interlaced in the strata of blue shaley clay. The presence of this water was not detected during the exploration foundation borings because a jetting type boring method was allowed. However, during the time between the exploration borings and the actual construction of the shafts there were several heavy rains which caused the creek to overflow its banks, and it is suspected that this may have created the water-filled seams. The presence of this water did not interfere with the drilling of the shafts, but was especially troublesome in construction of the bell footings as it caused the tops of the bells to cave. The contractor soon found that the easiest way to combat the seepage water was by speeding up his operations. It seemed that the centrifugal force of the drill would push cuttings into the water seams and seal them off for several minutes. Therefore, if the reinforcing steel and concrete was ready and waiting when the drilling and underreaming operations were completed, the bottom of the shaft and bell could be hand cleaned of loose material and steel and concrete placed before the water broke through. However, several times it was not possible to complete the excavation and cleaning before the water began to flow with considerable volume, and when all attempts at calking failed, the shaft had to be drilled deeper and another bell excavated.

The elimination of bell footings on



Buckners Creek, FM 154.

Buckners Creek, FM 154.

Buckners Creek, FM 154.

Jack John Creek, FM 154.

Buckners Creek, FM 609.

drilled shafts for FM bridges would probably bring about more economy and increase in feasibility for the type substructure than any other factor. The Bridge Division has made it known that they are preparing to set up a series of tests to prove that in reasonably stable formations enough friction is created between the concrete surface of the completed shaft and the surrounding earth strata to offer a resistance to settlement equal to or greater than the resistance offered by the bell. If this can be proven and the bells eliminated, then the contractors and engineers need not have too great a fear of seepage water and cave-ins.

Another factor that would surely increase the economy of this type substructure is the exercising of more care in obtaining exploration foundation borings. If, after some experience, the contractors learn that they can depend upon the foundation logs shown on the bridge layout sheets in planning their drilling operations, then bid prices will probably become lower. To obtain accurate data about the existing earth formations, core samples should be recovered and an adequate number of Standard Penetrometer Tests should be made upon which a log can be based. In cases where doubt exists as to the water bearing qualities of the stratum in which the bell footing is to be constructed, and the size of the structure will justify the expense, a 24-inch diameter hole should be drilled to determine that construction of the bell is feasible.

Before beginning construction of the first drilled shafts in this residency, considerable uneasiness was felt toward the practicality of the design and the difficulties that would certainly arise before the foundations were completed, but after completion of the third bridge, the designers agree that this type substructure will be the first considered for all future bridges.

●●●

Did you know...

There are 600 miles of four-lane divided highways in Texas. It is estimated that a four-lane divided highway is required to safely carry a volume of traffic in excess of 4,000 vehicles per day. Texas has 3,000 miles of two-lane highways carrying more than 4,000 vehicles daily.

As of January 1, there were 50,581 miles of highways under state maintenance or obligation. The 3 1/2 million vehicles registered in Texas, plus the out-of-state vehicles, travel a total of 86 million miles daily over these roads.

Seven per cent of the total public roads in the United States are in Texas. Since 1949 the state highway system has increased 26 per cent. The city street system has increased 9 per cent, while the county mileage has decreased 6 per cent.

RECONVEYANCE OF RIGHT OF WAY

The Austin office has been receiving numerous requests from the field to reconvey direct to the original owners tracts of land donated to the State and no longer needed for highway purposes.

Departmental policies to govern disposition of right of way were expressed in Administrative Order No. 29-53, dated August 21, 1953. Under this policy, if the State's title to such land was acquired by donation, the Department will return the land to the grantor, heirs or assigns. If title was acquired by purchase by the City or County, the Department will return to the City or County, or at the request of the City or County, will return the land to the grantor, heirs, or assigns.

In looking up the record on these tracts no longer needed for highway purposes it has been noted that often the Department files do not reflect just what part, if any, the City or County played in the acquisition of the land. In many cases the deeds are drawn up in such a manner as to make it appear that property was conveyed to the State without remuneration to the owner when actually a cash or other valuable consideration was provided by the City or County.

This new Administrative Order requests that future requests for reconveyance of property of this nature to the original owner be accompanied by a certified copy of a resolution from the City Council or County Commissioners Court approving such action, unless the District can make the definite statement that the governing body was not involved in the transaction.

The Planning Survey, Road Design, and Maintenance Operations Divisions of the Highway Department have just completed a study to determine the speeds of loaded trucks on hills. Results of this analysis will be used in planning and designing auxiliary climbing lanes for trucks on steep grades.

If unlimited funds were available to the Department, climbing lanes could be built on all grades. However, since funds are limited, the data secured by these tests will aid in determining the grades on which climbing lanes are justified. When correlated with other studies such as traffic volume counts, the results may influence construction of four-lane highways in areas with high traffic volumes but minimum grades.

Previous to these tests, the Highway Department used graphs compiled from information furnished by tests in other states. The tests were run to establish the accuracy of existing graphs and to compile a set of new graphs for the use of planning engineers in the Highway Department.

A section of Ranch to Market Road 93 in Travis and Burnet Counties west of Austin was selected for making the tests. The eleven test sections of road were located between Oak Hill and Spicewood, and had grades varying from 0.20 per cent to 7.62 per cent. This particular length of roadway was selected because of its steep grades and low traffic volume.

An International Harvester two-axle truck-tractor with a 162-horsepower motor was loaned to the Highway Department free of cost by the International Harvester Company in San Antonio. Also loaned free of charge to the Department was a 33-foot Hobbs tandem-axle flatbed trailer by the Hobbs Manufacturing Company in San Antonio. This particular truck-trailer combination was chosen to make the tests because it is the general type most frequently used by heavy haulers on the highways.

Charles Ogle of the Texas Motor Transportation Association in Austin arranged for these loans.

In running the tests, pneumatic tubes which actuate electric switches when run over, were stretched transverse to the highway at 100-foot intervals. The test employed two instruments to measure the exact time each axle of the truck crossed each tube.

One of the instruments, accurate to about one-tenth of a second was an Esterline-Angus 20 pen graphic recorder, owned by the Department. The second instrument, accurate to about one one-thousandth of a second, was an oscillograph and camera with a tuning fork timer, rented from Petty Laboratories Incorporated of San Antonio, at a fee sufficient to cover insurance on the instrument. Bill Welty of Maintenance Operations, formerly employed by Petty Laboratories, was instrumental in obtaining this pre-

cision instrument for Department use. This oscillograph is most frequently used by geophysical companies in oil explorations.

The gross weight of the truck and loaded trailer was 57,180 pounds. The trailer was loaded with fourteen-inch H-beam steel piling borrowed from the Bridge Division.

Grades ranging from 700 to 1,500 feet in length were used for the test and the truck was timed both climbing the grade and picking up speed on the downgrade. An arbitrary figure of 30 miles per hour was selected as the speed at which trucks should be taken out of the regular traffic lanes, and also at which to channel them back into the stream of traffic on the downgrade. The recommended transition distance for entering and leaving a climbing lane or an acceleration zone is 525 feet. This provides for the truck to travel in a path conforming to a one-degree horizontal reverse curve.

The use of the climbing lane is strongly recommended wherever warranted whether on new construction or maintenance betterment. The geometric and structural design of the extra lane should provide a minimum width of twelve feet and a pavement depth equal to that of the normal two-lane road.

The test was conducted by the Planning Survey Division under the direction of Reed Baker in the Austin office and Frank Scrivner and K. G. Crawford in the field. Driver of the truck was Gene Voltz, of District 14 in Austin.

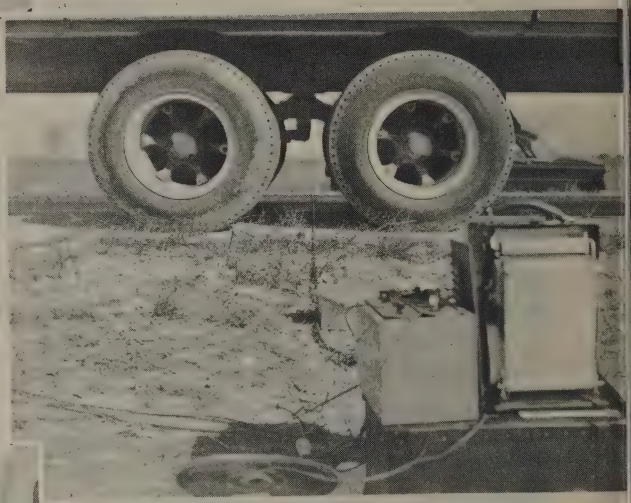
Data compiled from this survey will be published in a later issue of "Highway News."

Test truck (in distance) approaches typical grade used in study.

Speed of truck is measured by time recorder and oscillograph (in panel truck) as it accelerates downgrade.

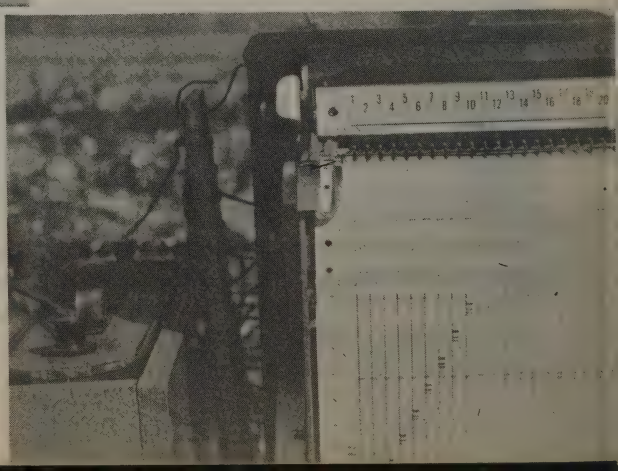
Close-up of loaded test truck and pneumatic detector tube used in measuring speed.

Time recorder in foreground records interval between axles as the truck pa over detector tube.



The oscillograph records time interval between axles as truck passes over detector tube at each station.

Chart on time recorder showing recording of typical test run.



3-Level Traffic Separation

At West End of Baytown Tunnel

Randle B. Alexander, Bridge Engineer
Bridge Division

This structure is the first one of its type on the State Highway System and is believed to be the first three-level highway structure in Texas.

Included in the contract of the consultants employed for the design of the tunnel was the preparation of an over-all highway plan from Highway 225 to a connection with State Highway 146, near the town then called Goose Creek. Their plan contemplated two structures at the location of the three-level separation and involved a crossing of the T& NO at grade.

District Engineer Jim Douglas and his assistants felt that there should be a better solution to the problem of traffic separation and interchange at this point, and evolved the three-level separation idea into sketches which were submitted to the consultants and to the Austin office. After some discussion with the consultants, they agreed that the proposed scheme had some advantages over the one first proposed by them, but some resistance was met in the Austin office and from other agencies, to this idea. There was some feeling that the traffic did not justify this elaborate installation. This, coupled with the thought that this type of installation was being urged for its very uniqueness, almost stymied the project.

In meeting some of the objections to the installation, it was pointed out that the lowest level could be drained by gravity, and that the highest level was somewhat lower than the ordinary railroad overpass. Furthermore, there were no retaining walls necessary. Wide cuts with flat back slopes provided ample visibility. The indigenous high trees served to lower the apparent height of high level and, all in all, a very natural effect was visualized and has been secured in the construction of the separation.

Standard continuous I-beam spans, skewed to fit the road, were utilized. The curves in the span were secured by the use of the steel I-beams as chord sections and varying the concrete to make the required curvature. It was necessary to clip off a couple of cap corners in order to provide the clearance for high loads prescribed by the A.A.S.H.O. Standards. Welding was used to splice the I-beams and no particularly difficult construction problems were encountered.

The spans are supported by conventional three-legged bents which are in turn setting on fourteen-inch concrete piling.

The widths of roadway vary on account of differences in curvature of the road. The lower level (ground) has a roadway of 34 feet, the middle level 31 feet, and the top level 28 feet. In this manner, the width apparently decreases with height. This is only apparently so, for if a wider top level was required, no unpleasing appearance would result.

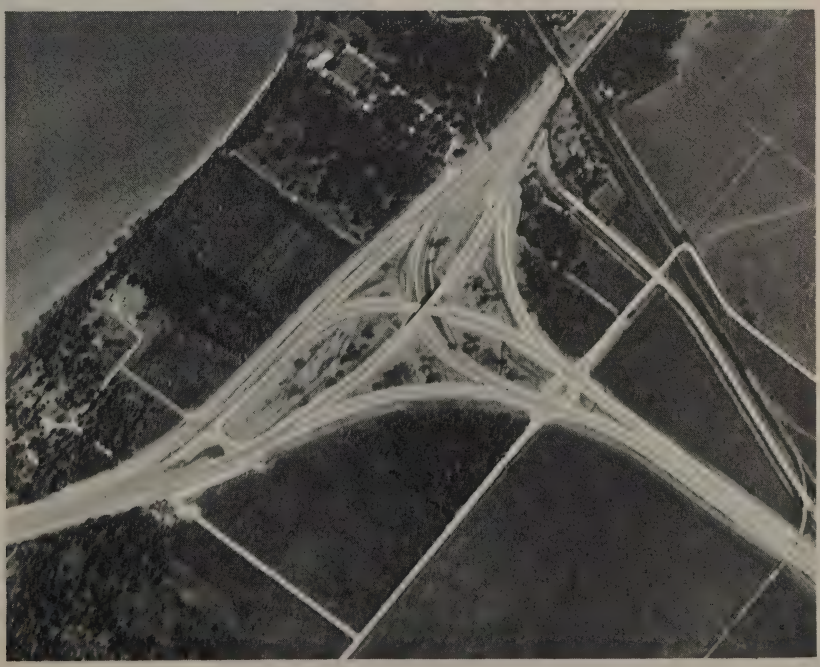
Construction on three-level traffic separation.

Entrance to

Looking northeast.

town Tunnel.

Looking southeast.



Aerial view of traffic separation

Trash

DISPOSAL UNITS IN ROADSIDE PARKS

Rudolph Riefkogel, Senior Landscape Adviser
Maintenance Operations Division

In District 16 two types of trash disposal units are used in roadside parks. Both units are sanitary because they are flyproof and odorproof. They can be placed near tables and benches within easy reach of park users. Convenient location is important to encourage use of these units. The units have given long-lasting, satisfactory service for little maintenance.

Disposal wells and incinerators are designed and constructed to harmonize with other park fixtures. All fixtures, tables and benches, disposal unit, fireplace, are placed on a reinforced concrete slab four inches thick. This concrete slab is connected with the surfaced park road or turnout by a concrete or asphalt walk.

The incinerator was designed and constructed by Jim Cockroft, Construction Foreman, who was in charge of park development in District 16. He also revised the standard design of the disposal well and developed a more convenient and pleasing fixture.

Disposal wells are installed where soil conditions permit drilling a well with a power auger of desired depth. Where wells cannot be drilled, incinerators are erected.

The disposal well is constructed by drilling a hole 30 inches or 36 inches in diameter to a depth of sixteen feet or more. Deep wells are preferred. In the throat of the well a section of galvanized, corrugated metal pipe, equal to the diameter of the well, is inserted. The pipe extends six feet or more below the ground line, depending on type of soil, and twenty inches above the ground line. As a safety feature, three-eighths-inch cross bars are welded inside the pipe twelve inches from the top. A metal top piece, mounted with lid stay and raised lid is welded to the top of the pipe. Reinforced concrete four inches thick is poured around the pipe above ground line.

Handmade bricks 4 x 4 x 12 inches, or other materials are used to veneer the exposed section of pipe. Reinforced concrete four inches thick is poured in place on top of this veneer and metal top piece flush with lid. Outside dimensions for a well 36 inches in diameter are 44 x 44 x 24 inches. Height is kept the same as the fireplace.

The incinerator has on the inside a "metal oven" with double doors in front and a lid on top. The oven is built from one-fourth-inch salvaged bridge floor plates cut to size and welded. A sliding grate rests on two angle irons eight inches above the concrete slab. The grate can be pulled out to remove nonburnable trash. The grate is chained to the inside of the oven near the door to prevent removing it.

The metal oven is placed on the concrete slab in the desired position and then veneered with 4 x 4 x 12 inch handmade bricks or other materials. A layer of sand is placed between the oven and veneer to prevent heat damage to veneer.

Reinforced concrete four inches thick is poured in place on top of the oven and veneer flush with the lid.

Incinerator before erecting. Metal oven manufactured by District Shop.

Incinerator in place on concrete slab with brick veneer and concrete top.

James A. Cockroft, Construction Foreman, admires his work on this set of park fixtures, all made of the same materials to harmonize.

Disposal well in place on concrete slab with brick veneer, concrete top, and metal lid. The well is eighteen feet deep.

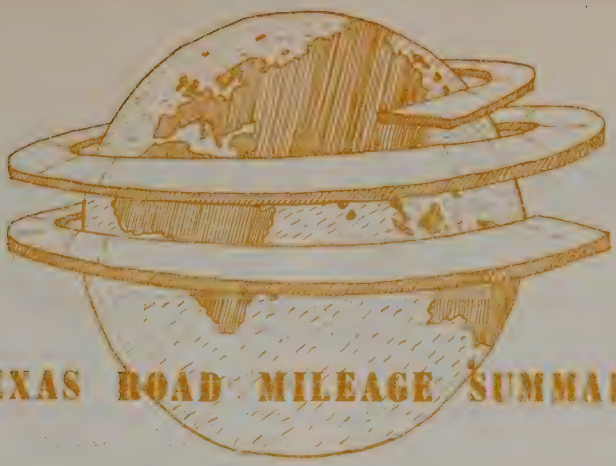
Outside dimensions of the incinerator are 30 x 48 x 40 inches. Larger or smaller incinerators may be constructed according to park use.

Trash disposal units require some maintenance to prevent filling up. Trash in wells is burned by opening the lid and placing a pipe attached to a funnel into the well. This funnel is turned toward the wind to provide air for burning trash. Another method to provide necessary air is by pumping air from a compressor into the well.

Trash in incinerators is burned by opening the double doors and lid to create a draft and let smoke escape. Kerosene may be used with caution to start a fire in wells and incinerators.

These beer cans were collected on U. S. 83 between Falcon Dam site and Roma. This is a three-mile stretch, and the cans were accumulated over a period of ten days to two weeks. This amount of cans was picked up regularly the past year, but we expect that with the completion of the dam, this activity will slow down.

We have a similar situation on U. S. 59 immediately east of Laredo between the junction with U. S. 83 and the drive-in theater approximately one mile to the east, where we pick up a truckload of beer cans every Saturday morning.



TEXAS ROAD MILEAGE SUMMARY

TEXAS ROAD MILEAGE SUMMARY

As of January 1, 1954

Mileage of State and County Roads 197,685

STATE HIGHWAYS
- FA---- 15,926.13
- FAS--- 9,674.64 - (Of this 816 Mi. are new hwys. since Sept., 1945)
- NonFA- 699.72
- Total- 26,300.49

Designated but not yet under maintenance 452.94
Marked & Maintained 25,847.55

*Urban-City Maint. Paved: 143.97
*Urban-State Maint. Paved: 2,118.00
Rural-State Maint. 23,585.58

Earth 161.20
**Metal Surface 21.84
Paved 23,402.54

FARM TO MARKET ROADS
- FAS--- 15,139.01
- NonFA- 9,243.80
- Total- 24,382.81

Designated but not yet under maintenance 4,857.53
Marked & Maintained 19,525.28

*Urban-City Maint. Paved: 18.57
*Urban-State Maint. Paved: 469.28
Rural-State Maint. 19,037.43

Earth 64.39
**Metal Surface 44.11
Paved 18,928.93

TOTAL HIGHWAY SYSTEM
- FA---- 15,926.13
- FAS--- 24,813.65
- NonFA- 9,943.52
- Total- 50,683.30

Designated but not yet under maintenance 5,310.47
Marked & Maintained 45,372.83

*Urban-City Maint. Paved: 162.54
*Urban-State Maint. Paved: 2,587.28
Rural-State Maint. 42,623.01

Earth 225.59
**Metal Surface 65.95
Paved 42,331.47

Dustless road mileage in State:

County System ...	8,960
State System ...	45,081
Total	54,041

Total street mileage in all Texas incorporated cities . . . 26,857

* Urban refers to mileage within incorporated cities.
** Metal includes gravel, caliche, shell, etc.

ROTARY MOWERS

R.A. Scott, Senior Maintenance Superintendent
District 12

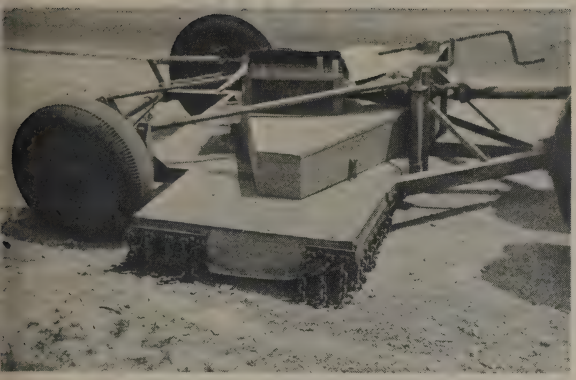
Considerable interest has been shown in the use of rotary-type mowers in District 12. It is felt that the following comments and photographs will go a long way toward answering the question of whether rotary mowers can be used to advantage in other districts.

Two rotary mowers were bought late in 1951 and ten in the spring of 1952 at a purchase price of $400. They are operated at an equipment rental rate of $0.43 per hour including depreciation. The machine is powered from the power take-off of a 24 horsepower tractor. In the early use of the mower, it was thought that a 16 horsepower tractor would furnish adequate power but it soon became evident that more power was required for successful mowing.

Each mower makes a cut of seven and one-half feet and cuts approximately as much per day as would be cut by two sickle-type mowers of equivalent size. There are some areas on the right of way, such as steep back-slopes and around bridge and culvert ends, where the use of rotary mowers is not applicable. Though rotary mowing can be done anywhere a tractor can be operated, it has been the practice in District 12 to use three rotary mowers to do the bulk of the mowing and one sickle

Complete tractor and mower kit.

Mower without chain safety.



Mower with chain safety guard.

Small quantity of fresh clippings spread on concrete pavement show texture and degree of shredded clippings.

mower to mow those areas which could not be cut advantageously with rotary equipment.

The question is often raised about the throwing of cans, bottles, stones, and other objects into the line of traffic. This is very easily overcome by welding short lengths of chain on about six-inch centers on the right hand side of the mower. (See Photograph 3.) These chains deflect objects which might have been thrown from under the mower canopy, and at the same time they do not interfere with mowing operations or cause the accumulation of grass clippings in piles or windrows.

Rotary mowers, even in rank vegetation, do a neat job of mowing. The mower shreds the clippings and deposits them rather evenly over the entire cut area. In very heavy cutting, a hardly noticeable windrow is sometimes found, but in no case is there excessive piles or windrows of grass. No trouble has been experienced from clogging with grass and weeds because of the mower's ability to shed these. See photographs 4 and 5.

In conclusion we do not feel that rotary mowers are the answer to our mowing problems, but they are more efficient than anything we have used in the past.

Typical mowing showing condition after cutting grass and weeds eighteen inches to three feet tall. Note absence of windrows or piles of clippings.

Close-up of mowed area showing distribution of clippings. Note type of small pile of clippings in lower center, also amount of uncut area around sign post.

Time-saving Tables

L.S. Partridge, Senior Resident Engineer
District 3

Of the following three tables, two deal with asphaltic concrete, and the third is used in checking dump-truck beds.

In using the "Dump Truck Volumes" table, the depth of bed required to haul a given amount can be determined by inspection. For example: A truck bed is 72 inches wide and 84 inches long. Required, the depth to haul four cubic yards. Following instructions listed on the table, opposite 84 inches go horizontally until the figure 4.0 is reached. (See shaded areas on table.) Then go vertically to the line 72 inches is found on. At the intersection, we find 30 3/4 inches.

It will be noted that this is not an exact answer but it is within one-eighth of an inch, which is close enough in most instances. In other cases there are similar errors but it is believed they are also within one-eighth of an inch of the correct depth.

The tables for use with asphaltic concrete contain examples for use and are self-explanatory. It is realized that they are rather limited in use, but even if the particular table is not applicable it can be used to make a similar table. A table for any similar job can be made in a few minutes time that will save many minutes work and reduce the chance of errors in numerous calculations. In fact, tables can be prepared covering numerous conditions that will save hours of calculations. The principal limitation is the number of variables, which should not be more than four.

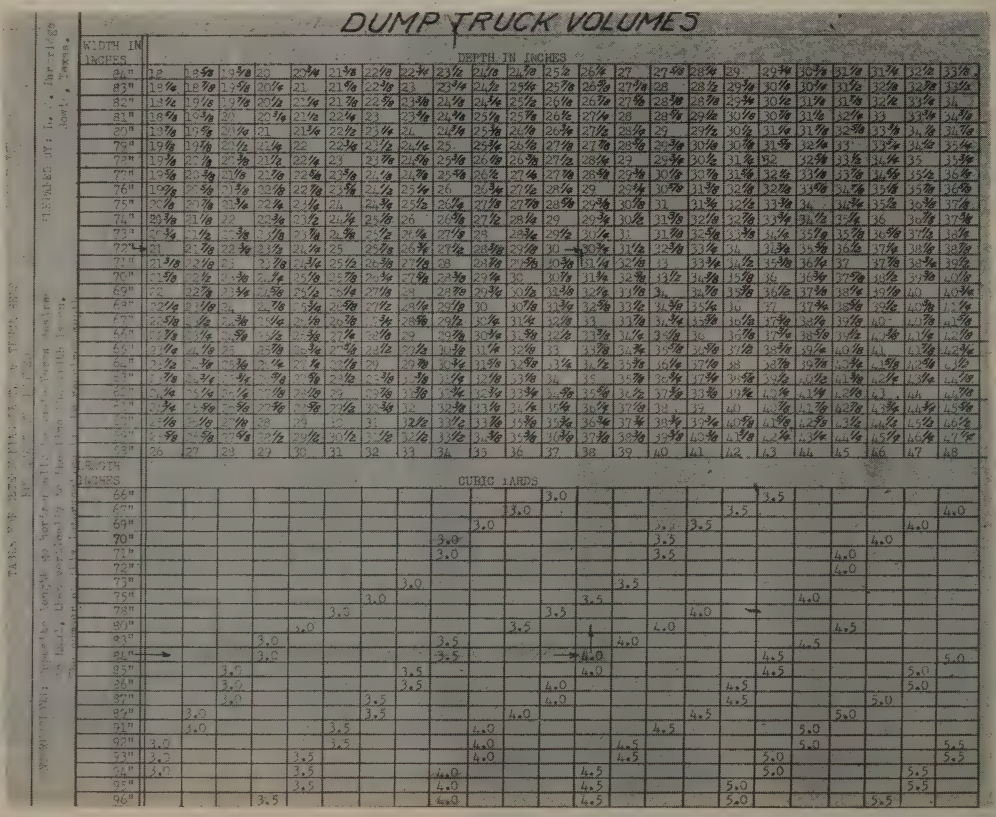


TABLE OF ADD-DISTANCES (To be added to distances at top of table.)

NUMBER OF LOADS.	1	2	4	5	6	8	10
0	0	0	0	0	0	0	0
		1	2		3	4	5
1	2	4	5	6	8	10	
		3	6		9	12	15
2	4	8	10	12	16	20	
		5	10		15	20	25
3	6	12	15	18	24	30	
		7	14		21	28	35
4	8	16	20	24	32	40	
		9	18		27	36	45
5	10	20	25	30	40	50	
		11	22		33	44	55
6	12	24	30	36	48	60	
		13	26		39	52	65
7	14	28	35	42	56	70	
		15	30		45	60	75
8	16	32	40	48	64	80	
		17	34		51	68	85
9	18	36	45	54	72	90	
		19	38		57	76	95

DIST. NO. OF 16,000# LOADS WILL COVER FOR ONE TEN-FT. LANE

Number of Loads.	60	70	80	90	100	110	120	130	140
1	60	70	80	90	100	110	120	130	140
2	120	140	160	180	200	220	240	260	280
4	240	280	320	360	400	440	480	520	560
5	300	350	400	450	500	550	600	650	700
6	360	420	480	540	600	660	720	780	840
8	480	560	640	720	800	880	960	1040	1120
10	600	700	800	900	1000	1100	1200	1300	1400
	LBS. PER S. Y.								
	240	206	180	160	144	131	120	111	103
	238	204	179	159	144	131	120	111	103
	236	203	178	158	143	130	119	111	103
	234	202	177	158	142	130	119	110	102
	232	200	176	157	142	129	118	110	102
	230	199	175	156	141	128	118	109	101
	229	197	174	155	140	128	117	109	101
	227	196	173	154	140	127	117	109	101
	225	195	172	154	139	127	116	108	100
	223	193	171	153	138	126	116	108	100
	222	192	170	152	137	125	115	107	99
	220	191	169	151	137	125	115	107	99
	218	190	168	150	136	124	115	107	98
	217	188	167	150	136	124	114	106	98
	215	187	166	149	135	123	114	106	98
	213	186	166	148	134	123	113	105	98
	212	185	165	147	134	122	113	105	97
	210	184	164	146	133	122	113	105	97
	209	182	163	146	133	121	112	104	97
	207	181	162	145	132	121	112	104	96

TABLE FOR COMPUTING ASPHALTIC CONCRETE RATES
FOR
ONE TEN-FT. LANE & 16,000 Lb. LOADS

EXAMPLES SHOWING USES OF TABLE:

A 10-ft. lane is being surfaced and it is found that 10-16,000 Lb. loads covered a distance of 1160 Ft.

The amount per S. Y. is desired.

On the line horizontally with 10 loads, follow vertically down until the 60 feet add-line is reached. The number 124 is read at this intersection, which is 124lbs. per S.Y.

A lane lacks 750 ft. of being completed.

It is desired to know the number of loads required to finish the job at a given rate of 130 lbs. per S. Y.

Locate 130 on the table, thence vertically to 660. It is noticed by interpolation that 7 loads will cover 770 ft. plus about 10 ft. of add-distance or 780 ft. Thus it will take 7 loads to complete the lane.

DIST. NO. OF 16,000 Lb. LOADS WILL COVER FOR ONE TWELVE-FT. LANE

NUMBER OF LOADS							1	2	4	5	6	8	10
							50	60	70	80	90	100	110	120	130
							100	120	140	160	180	200	220	240	260
							200	240	280	320	360	400	440	480	520
							250	300	350	400	450	500	550	600	650
							300	360	420	480	540	600	660	720	780
							400	480	560	640	720	800	880	960	1040
							500	600	700	800	900	1000	1100	1200	1300
1	2	4	5	6	8	10	LBS. PER S. Y.								
0	0	0	0	0	0	0	240	200	172	150	133	120	109	100	92
	1	2		3	4	5	238	198	170	149	133	119	109	100	92
1	2	4	5	6	8	10	236	197	169	148	132	119	108	99	92
	3	6		9	12	15	234	195	168	147	131	118	108	99	91
2	4	8	10	12	16	20	231	193	167	146	131	118	107	98	91
	5	10		15	20	25	228	192	166	145	130	117	107	98	91
3	6	12	15	18	24	30	226	190	165	145	129	116	106	98	90
	7	14		21	28	35	224	189	163	144	128	116	106	97	90
4	8	16	20	24	32	40	222	187	162	143	128	115	105	97	90
	9	18		27	36	45	220	186	161	142	127	115	105	96	89
5	10	20	25	30	40	50	218	185	160	141	126	114	104	96	89
	11	22		33	44	55	216	183	159	140	126	114	104	96	89
6	12	24	30	36	48	60	214	182	158	140	125	113	103	95	88
	13	26		39	52	65	212	180	157	139	124	113	103	95	88
7	14	28	35	42	56	70	210	179	156	138	124	112	103	95	88
	15	30		45	60	75	209	178	155	137	123	112	102	94	87
8	16	32	40	48	64	80	207	176	154	136	123	111	102	94	87
	17	34		51	68	85	205	175	153	136	122	111	101	93	87
9	18	36	45	54	72	90	204	174	152	135	121	110	101	93	86
	19	38		57	76	95	202	173	151	134	121	110	100	93	86

TABLE OF ADD-DISTANCES (To be added to distances at top of table.)

TABLE FOR COMPUTING ASPHALTIC CONCRETE RATES
FOR
ONE TWELVE-FT. LANE & 16,000 LB. LOADS
(Or a Nine-Ft. Lane & 12,000 Lb. Loads)

EXAMPLES SHOWING USES OF TABLE:

IT is desired to know the spacing of 16,000 Lb. loads of a blade course on 24-ft. width at a rate of 110 lbs. per S. Y.

Noting the 110-lb. rate is on the 9-ft. add-distance for one load, go vertically to the line for one load. Read 100 at this intersection. 100 plus 9 is 109, which the spacing on a 12-ft. lane. For 24-ft. width the spacing would be half this or 54.5 ft.

- - - - - - - - - - - - - -

For other uses of table see examples under table for 10-ft. lane.

PAINT STRIPE ON CONCRETE PAVEMENT

Alton Vordenbaum, Maintenance Superintendent
District 15

The durability of paint stripe on road surfaces depends upon a number of important factors - type of pavement, surface conditions, traffic density, lasting quality of the paint, and weather conditions.

It is generally known that paint stripe lasts much longer on most asphalt pavements than on concrete. Since concrete is rigid and unyielding, the impact of vehicles on the paint is much more severe on this type of pavement. Also, it is believed that during wet weather, moisture rising through the concrete to the bottom of the paint, together with the action of traffic, causes the paint to loosen and flake.

District 15 still has some concrete pavement that has not been covered with asphalt on which paint dash stripe has had a very short life. This has been especially so during the wet winter months. In some instances, as much as 30 per cent of the dash stripe has flaked off within three or four weeks.

U. S. 181 from the Bexar-Wilson County Line to the intersection with the Business Route, five miles northwest of Floresville, has concrete pavement on which this trouble was experienced. This section of highway has a sandy subgrade and the pavement is generally in good condition.

On a trial basis, it was decided to cut off the old paint, put down an aggregate dash stripe and then apply the paint on top of this as soon as the excess stone had been whipped off. RC-2 asphalt was used with a rate of application just heavy enough to hold the white grade 7 crushed aggregate. The paint was applied slightly heavier than usual. It was noted within a short time that bead retention was good.

The regular paint dash stripe was placed on the asphalt sections of this highway from San Antonio to Floresville at the same time, so that a ready comparison could be made between the two methods.

This work was done in the early part of April, 1953, and has been checked at night with both a wet and dry pavement.

Reflectivity on the raised paint dash stripe on the concrete has been found to be as good on dry pavement as the regular stripe, and better on wet pavement.

After having been in use for five months, the trial paint stripe is still in excellent condition. It went through the rainy season during the latter part of August and the early part of September without damage.

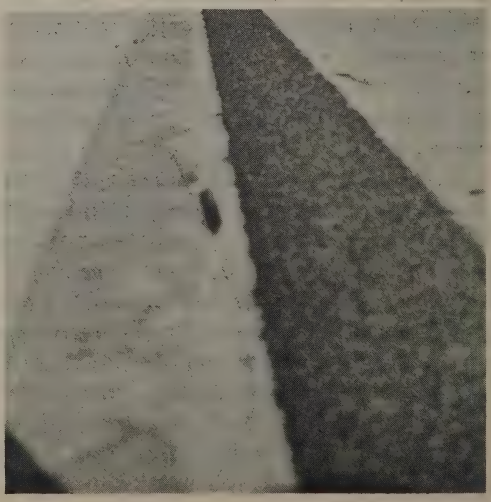
This method has also been found to be effective on slick asphalt pavement where the paint wears off prematurely.

In summarizing, it appears that a considerable saving could be effected by using this longer-lasting, raised dash stripe on concrete surfaces, particularly as it also gives more efficient service during wet weather.

New paint dash stripe on top of aggregate dash stripe. U.S. 181, Wilson County.

New paint dash stripe on top of aggregate dash stripe. U.S. 181, Wilson County.

Old paint dash stripe. U.S. 181, Wilson County.



Old paint dash stripe. U.S. 181, Wilson County.

TYPE 14
Modified Concrete Handrail

J.L. Gonzalez, Engineering Assistant
District 21

The Type 14 modified concrete handrail used on the recently terminated Valeno and Burro Bridges in Zapata County involved a good number of rather interesting details of construction. The two bridges have lengths of 1,860 and 1,190 feet, respectively. The handrail, which was cast in place, included 836 concrete posts, with an average spacing of eight feet between posts. The major consideration in casting the rail was maintaining a straight line over such a long span. There were, however, certain other aspects of construction which, the writer feels, are worthy of comment.

The first thing learned in pouring this type of handrail was that the conventional one and one-half inch maximum size coarse aggregate could not be used, particularly in the posts, without risking excessive honeycombing. The narrow space in the post form caused by the reinforcing steel bars and the rail bolts prompted the contractor to use three-fourths inch maximum size coarse aggregate. The results far exceeded the expectations, as the strength of the concrete increased with the smaller rock. Although, theoretically, the flexural strength should have decreased with the use of the smaller coarse aggregate, the result was probably due to the smaller amount of mixing water needed with the small aggregate to work the concrete inside the form. (The post in Picture 1 was poured with one and one-half inch coarse aggregate; the one in Picture 2 was poured with three-fourths inch maximum size.)

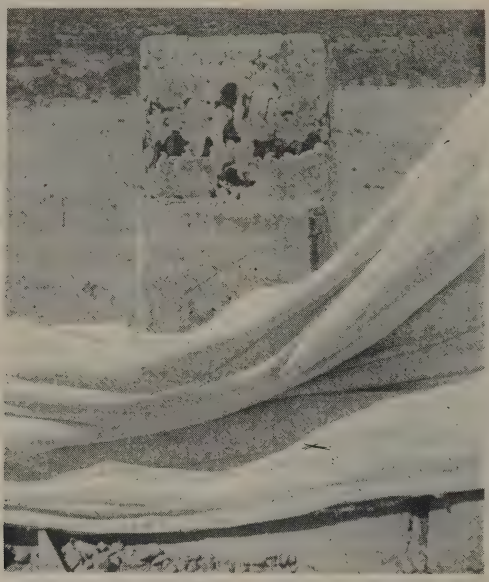
Secondly, some difficulty was encountered in getting smooth, well-shaped holes for the bolt sleeves and the countersunk nut holes in the back of the posts. The first posts poured had very jagged edges at these places and several of them had to be condemned if too much plastering was needed. A "casting dowel" was finally devised, consisting of a steel tube to which was attached a fulcrum-shaped steel piece with a bolt and nut (for the countersunk hole) as shown in Picture 3. This "casting dowel" was pulled approximately 30 minutes after pouring, thus leaving smooth holes for the pipe sleeve and the countersunk nut and washer on the outside of the post.

In attempting to pour the concrete rail in as straight a line as possible, two main factors had to be considered; first, the long span of both bridges, particularly the Valeno, and second, the excessive heat, severely affecting transit work. Both these problems were solved simultaneously. The first section of rail poured was at the center of the bridge. The following day, a target was lined up and clamped on this section of rail, as shown in Picture 4, to serve as a constant foresight. (Transit line for both rail and target were given early in the morning, to avoid the heat waves.) The rail was then poured toward the end of the bridge where the instrument was set. This process was then repeated for the other end of the bridge.

In order to obtain an even, straight chamfer, a rather unique method was employed which gave exceptionally

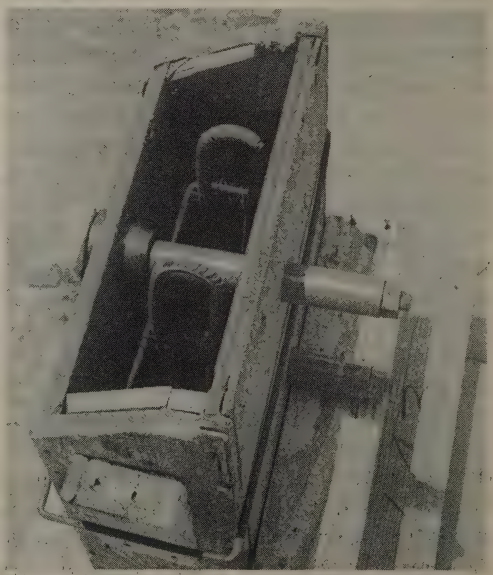
good results. Instead of nailing the chamfer to the form itself and making it subject to any irregularities in the form, it was nailed to a one-by "chamfer board," absolutely independent of form, as shown in Pictures 5 and 6. This board would be removed a few minutes after pouring, leaving a smooth, straight chamfer.

After the rail was completed, any slight deviation that was discovered in the line, attributed to those inevitable irregularities in concreting, was eliminated by widening or narrowing the chamfer. This procedure creates an optical illusion, giving the desired effect of an absolutely straight concrete handrail.



Honeycomb resulting from use of one and one-half inch aggregate.

Post using three-fourths inch aggregate.



Casting dowel used to form bolt hole.

Target used to secure good alignment.

Chamfer board used to secure straight chamfers on rails.

Another view of chamfer board.

Completed railing.

STORAGE OF EMULSIFIED ASPHALT

H.P. Largent, Senior Maintenance Foreman
District 7

The use of emulsified asphalt in this district has increased to the extent that year-around storage is necessary. The continuous "breaking" on the surface of the emulsified asphalt in storage tanks causes the formation of a thick asphaltic scum on the stored material. The length of time the material is stored determines the amount of asphaltic scum in the storage tank. Frequently there was as much as 200 gallons of scum that would not drain out of a 1,000-gallon tank and could not be used. Since there are not many methods of cleaning storage tanks available at maintenance sections, removing this scum and keeping the storage tanks clean presented a problem.

To avoid this trouble a small amount of diesel fuel is poured on the surface of the emulsified asphalt when it is placed in a storage tank. The amount of diesel fuel required depends on the surface to be covered; usually three gallons is sufficient to provide a thin covering over the material in a 1,000 gallon tank. The thin coat of diesel fuel excludes the air and prevents the "breaking" of the emulsified asphalt at the surface. Material stored in this way will drain out and leave the storage tanks reasonably clean. Also there is little or no lumping or stringing and all of the material stored is available for use.

Kerosene was also tried for this purpose. However, it was observed that kerosene volatilized to the extent that the protective film disappeared. Better results were obtained in this district using diesel fuel.

● ● ● ● ●

"Thats just what I've been trying to do, Fezby,---get the figures a little more clearly!"

. . . The highway from Laredo to El Paso is one of the best roads I have ever had the pleasure of touring. It's high, wide, and handsome.

As rumor has it, Texas is big, and I mean B-I-G. I discovered that on the drive from Laredo to El Paso. I have been to Texas in previous years (Houston, San Antonio, Amarillo, Wichita Falls) but this year it was all the more enjoyable. After wearing out three sets of tires on the Laredo-El Paso highway, and 3,196,742 Texas longhorns later, I finally saw the dawn of another day in New Mexico. I was beginning to think I would never make it.

Your roadside tables are well-kept and like an oasis to a tired traveler. However, they could do with drinking water. But I suppose it isn't practical in that desert region.

I am a transplanted New Yorker now living in Miami for the past six years. Perhaps you fellows can get together with our State Highway Department and teach them a few tricks on the art of constructing highways.

Thank you again for making my vacation a more pleasant one. And may I propose a toast to Texas, Brooklyn, and Heaven!

Irving M. Gross
Miami, Florida

. . . Everytime we take a trip I resolve to write the Highway Department and tell them how much we appreciate the work they are doing. Everywhere one goes in Texas the roads are good or being improved! When one has been on a trip through other states it's like getting into another world getting back on Texas roads – where the roads are wide, easy to drive on and well-marked.

The fellows who work on the roads are always so accommodating and very courteous, so from the least man on the job to the top engineer, I want to express my thanks.

Mrs. Alfred S. Myers
McAllen, Texas

. . . This is to report an automobile accident -- We were driving north from - - - about two miles from - - -. As we came over a slight hill, the road grader was headed straight across the highway a few hundred feet in front of us, moving from east to west, and apparently was going clear across the highway. There were absolutely no warning signs of any kind out – of "Men Working" as are ordinarily used with road work, no flagman out, or anything to slow traffic. In an effort to make a quick stop, the right wheels struck the loose gravel. I tried to pull the car back on the highway, it skidded across the highway to the left, hit a dirt terrace between the highway and a plowed field, a tire blew out and we turned over. So far, no serious injuries have developed, outside of soreness and bruises. We were traveling 50 miles an hour.

The damage to the car is covered by insurance, but we have had a lot of expense that will not be covered, and we feel that the Highway Department should reimburse us for this expense, since this was a direct result of negligence on the part of your employee. Three adults in a car just behind us have made statements to this and have offered to sign affidavits as proof.

(Signed)

. . . I have just returned from a motor trip to Fort Huachuca, Arizona, and back. I want to tell you how wonderful I think your roadside parks are. Texas is a big state and it does things in a big way. The tables are set far enough off the road to make it safe to let children out of the car, and they are covered to protect one from the sun.

I thought it a great pity when I saw evidence of abuse by thoughtless people to such wonderful rest stops.

Golden B. Smyth
Chattanooga, Tennessee

. . . You need luminous signs through towns . . .

Phillips, Nebraska

. . . We would prefer roads with no "dips."

Abington, Massachusetts

. . . We didn't like the tourist routes through congested areas in major cities.

Hermosa Beach, California

IN MEMORIAM

Don H. Ewing, maintenance employee engaged in placing string line for center stripes on U.S. 80, Kaufman County, four miles west of Terrell, was struck by a commercial truck and instantly killed on December 22.